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Benefits of acute intermittent hypoxia for treating spinal cord injury

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Most spinal cord injuries (SCIs) in humans and animals are incomplete and partial recovery arises as a result of plasticity within neural circuitry. Many experimental therapies have been used to improve recovery after SCI, Acute intermittent hypoxia (AIH-brief exposures to reduced O_2 levels alternating with normal O_2 levels) in one of them. AIH treatment elicits plasticity in respiratory and non-respiratory spinal systems in experimental animals. AIH treatment has also been shown to improve walking abilities in persons with chronic incomplete SCI. In this study, I have examined the effect of AIH treatment, alone or in combination with motor training, on functional recovery and the effect of AIH on the expression of plasticity and hypoxia-related proteins in the spinal cords of SCI rats. Rats were trained to cross a horizontal ladder and foot slip errors were measured before surgery, four weeks post-surgery, each day of AIH treatment, and 1, 2, 4 and 8 weeks after treatment. AIH treatment consisted of 10 episodes of AIH: (5 min 11% O_2: 5 min 21% O_2) for 7 days. Motor training +AIH-treated rats made fewer footslips on the ladder task compared to normoxia-treated control rats after four days of treatment and this improvement was sustained for eight weeks post-treatment. Importantly, AIH treatment + motor training also increased the expression of Hypoxia-inducible factor-1α, Vascular endothelial growth factor, Brain-derived neurotrophic factor, tyrosine kinase B receptors and phospho-trkB in spinal motor neurons in SCI rats compared to normoxia-treated SCI rats. Taken together with the promising findings from human SCI studies, the results of this study suggest that AIH has potential as an effective therapy to restore motor function after nervous system injury.

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